

Ohio Operations Incident

Hannibal, OH

Water, Soil, and Sediment Sampling and Analysis Adjustment Plan Version 1.0

Prepared On Behalf Of:

Statoil

Prepared By:

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1.0 INTRODUCTION AND PURPOSE

This adjustment plan is being prepared to further refine water, soil, and sediment sampling efforts initiated after the Ohio Operations Incident based on the data collected, the completion of remediation efforts at various locations, and comparison of analytical results to ecological and human health screening levels established by the Ohio EPA, USEPA Region V RCRA, and USEPA. To date, the original Sampling and Analysis Plan (SAP), approved by Unified Command, has been utilized for the following functions:

- Sample surface water at seventeen fixed sampling locations daily covering the Ohio River, Opossum Creek, Well-pad outflows and drainage, and an unnamed tributary from the well pad to Opossum Creek (Appendix A);
- Collect soil boring and hand boring samples around the well pad (Appendix B);
- Collect sediment samples at fifteen fixed locations periodically, in conjunction with the surface water samples discussed above; and after rain events.
- Collect water run-off samples at outflow pipes and well-pad run-off daily, as necessary.

Water, soil, and sediment sampling efforts were initiated on Sunday, June 29, 2014. At the request of Unified Command – ICP Hannibal, environmental sampling has been conducted under the SAP that was approved by Unified Command (UC) on July 2, 2014 and revised on 7/13/2014.

The following sections identify the rationale for a reduction and/or elimination of environmental sampling efforts for the Ohio Operations Incident.

2.0 Environmental Sampling Results

Per the Environmental SAP, currently approved by Unified Command and implemented by CTEH®, sampling was performed daily for surface water, periodically for sediment (two sampling events have currently occurred), and soil samples were used to delineate any potential migration of materials from the Eisenbarth well pad. Due to weather and safety stand downs, all fixed sampling locations were not sampled every day; however, the collection of surface water and sediment samples has been ongoing for 17 days.

Reported data has been compared to screening levels identified by the Ohio EPA and Region V USEPA as being protective of human health and aquatic life. Of the over 180 surface water samples, 30 sediment samples, and 27 soil samples collected through July 16, 2014, the primary chemicals of potential concern have been identified as Acetone and Chloride.

Initially water sampling from well pad runoff was compared to samples taken from upstream tributaries to exclude natural creek constituents. 25 preliminary chemicals of potential concern were identified (Figure 1.)

Upstream	Source
Acetone	1-Methylnaphthalene
Aluminum	2-Butanone (MEK)
Barium	2-Methylnaphthalene
<i>bis(2-Ethylhexyl)phthalate</i>	2-Methylphenol(o-Cresol)
Calcium	3&4-Methylphenol(m&p Cresol)
Chloride	Acetone
Chromium	Aluminum
Fluoride	Antimony
Iron	Arsenic
Magnesium	Barium
Manganese	Benzene
Nitrate as N	<i>bis(2-Ethylhexyl)phthalate</i>
Nitrite as N	Bromide
Phosphorus	Calcium
Potassium	Chloride
Sodium	Copper
Strontium	Ethylbenzene
Sulfate	Fluoride
	Iron
	Lithium
	m&p-Xylene
	Magnesium
	Manganese
	Naphthalene
	Nitrate as N
	Nitrite as N
	o-Xylene
	Phenanthrene
	Phenol
	Phosphorus
	Potassium
	Pyrene
	Sodium
	Strontium
	Sulfate
	Toluene
	TPH (C10-C28)
	Xylene (Total)
	Zinc

Figure 1. Identification of COPCs from well-pad Run-off.

Of the 25 COPCs initially identified, 15 were localized only to the well-pad run-off samples. These 15 were not detected in the tributary or Opossum creek following the incident (Figure 2.)

COPC	Detection Profile
1-Methylnaphthalene	Source Only
2-Butanone (MEK)	Source Only
2-Methylnaphthalene	Source Only
2-Methylphenol(o-Cresol)	
3&4-Methylphenol(m&p Cresol)	Source Only
Acetone	
Antimony	Source Only
Arsenic	
Benzene	Source Only
Bromide	
Chloride	
Copper	Source & Ohio Only
Ethylbenzene	Source Only
Lithium	
m&p-Xylene	Source Only
Naphthalene	Source Only
o-Xylene	Source Only
Phenanthrene	Source Only
Phenol	
Pyrene	Source Only
Sodium	
Toluene	Source Only
TPH (C10-C28)	
Xylene (Total)	Source Only
Zinc	

Figure 2. COPCs only detected in Source Samples.

This resulted in a list of ten potential COPCs that were detected in the tributary or Opossum Creek following the incident:

- ☐ 2-methylphenol (o-cresol)
- ☐ Acetone
- ☐ Arsenic
- ☐ Bromide
- ☐ Chloride
- ☐ Lithium
- ☐ Phenol
- ☐ Sodium
- ☐ TPH (C10 – C28, DRO)
- ☐ Zinc

Detections for 2-methylphenol, arsenic, lithium, bromide, and phenol were 1-2 day events (Figure 3). None of these detections exceeded ecological screening values set by the Ohio EPA as being protective of aquatic life. None of these constituents have been detected since July 2 and all detections were localized to the area surrounding the wellpad.

2-Methylphenol (ug/L)				Bromide (mg/L)				
Location	Date	Results	SL	Location	Date	Results	SL	River
SW06	6/29/2014	1.5	230	SW17	7/1/2014	1.5	NE	Tributary
				SW18	7/1/2014	1.8	NE	

Arsenic (ug/L)				Lithium ug/L			
Location	Date	Results	SL	Location	Date	Results	SL
SW06	7/1/2014	5.4	150	SW06	6/29/2014	181	260

Phenol (ug/L)			
Location	Date	Results	SL
SW06	6/30/2014	1.7	400
SW06	7/02/2014	1.2	400

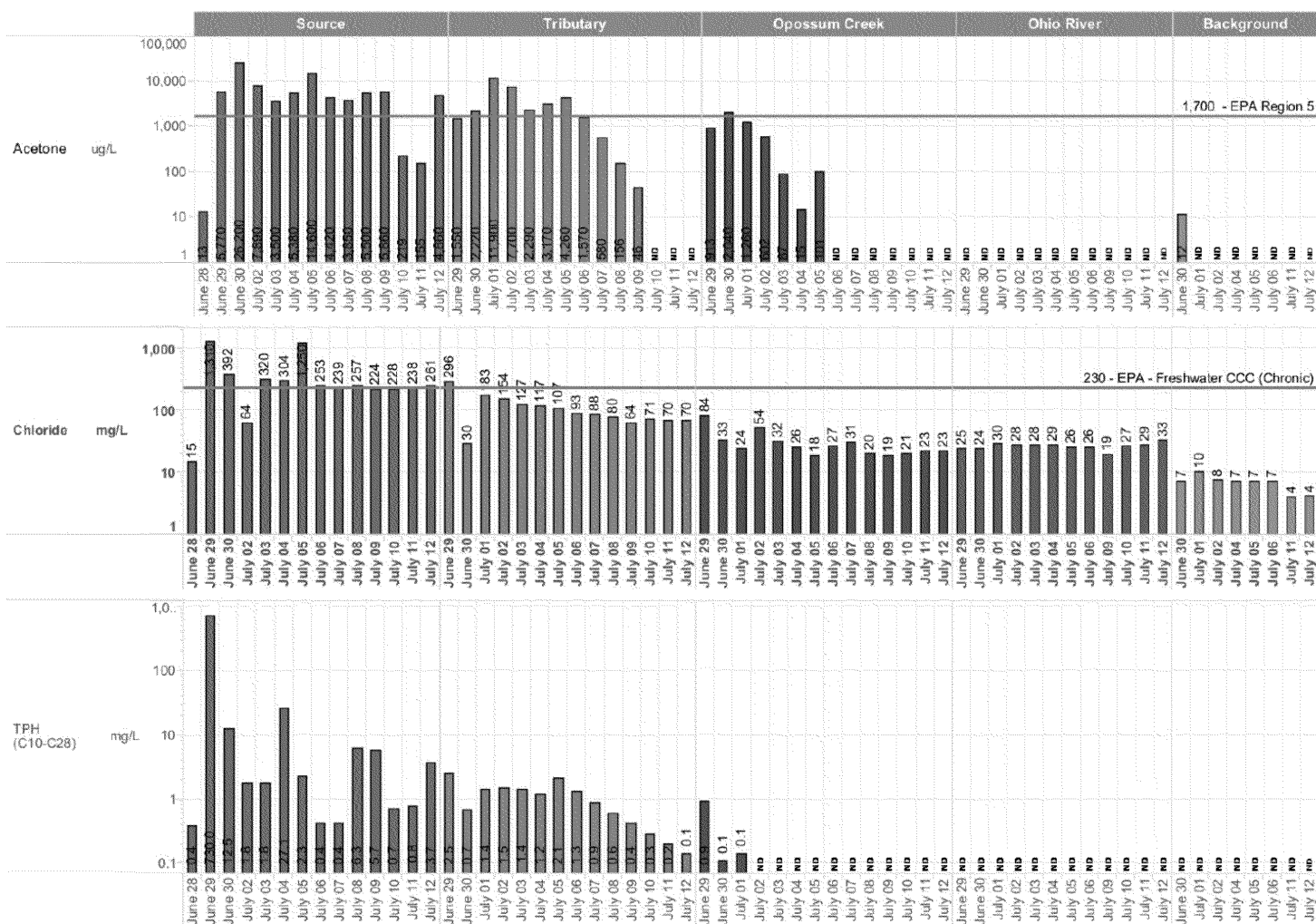
Figure 3. Detection of analytes immediately following incident.

Additionally, zinc was only detected in 1 sample taken nearest to the wellpad directly following the incident on 6/29/2014 (Figure 4). However, it is regularly detected in low levels in the Ohio river, and is likely a result of the large amount of industrial work performed along the river. All detections have been below ecological screening values set by the Ohio EPA as being protective of aquatic life.

Zinc (ug/L)				
Location	Date	Results	SL	River
SW06	6/29/2014	13.7	120	Tributary Ohio
SW07	7/1/2014	11.4	120	
SW10	6/29/2014	13.5	120	
SW10	6/30/2014	12.2	120	
SW16	6/30/2014	11.4	120	

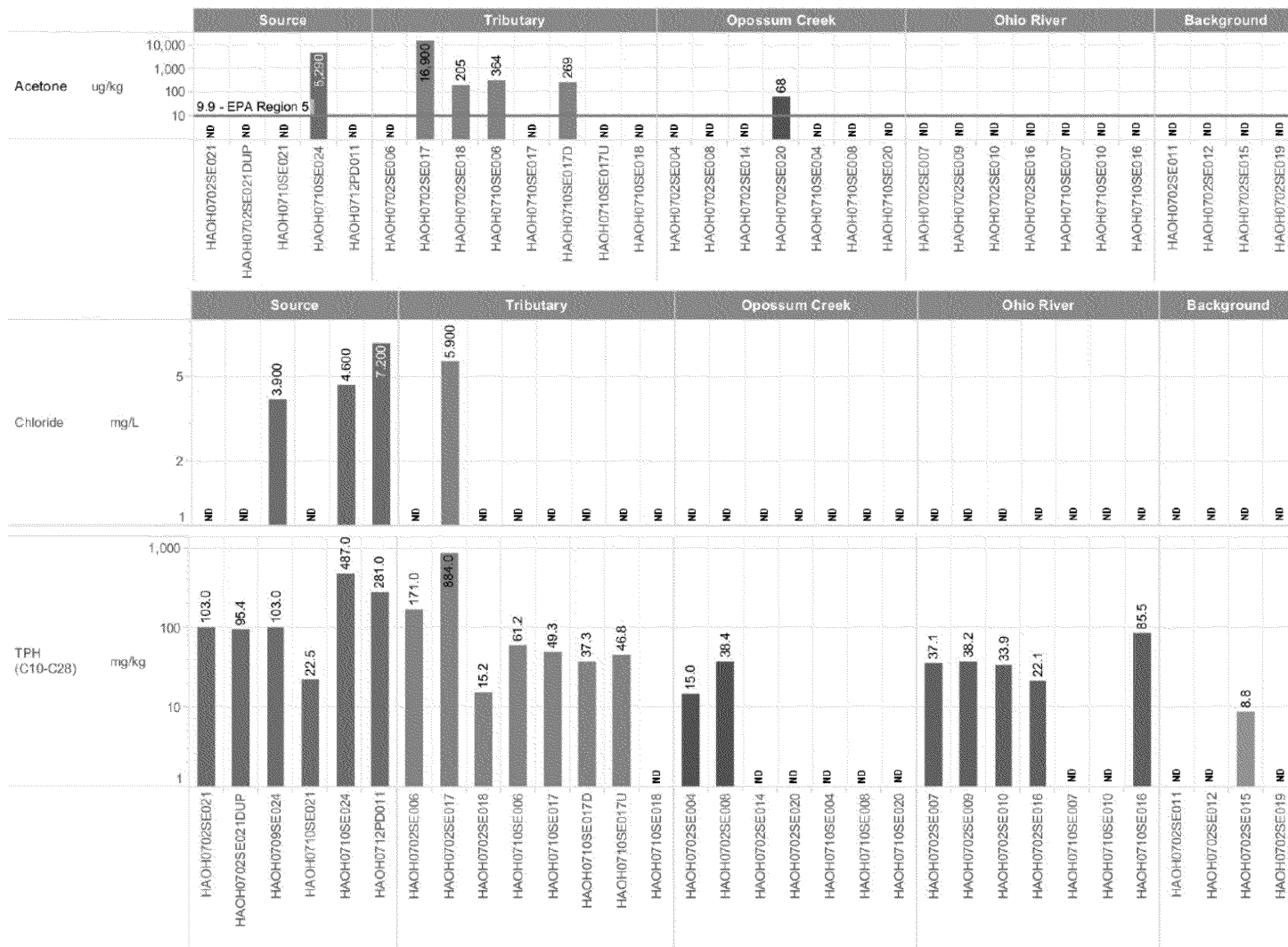
Figure 4. Zinc detections.

Based on these results, the primary COPCs as a result of the Ohio Operations Incident at Eisenbarth pad include chlorides, acetone, and general organics (TPH-DRO). While at the onset of the incident, surface water acetone and chloride levels exceeded chronic exposure levels set by the OhioEPA to be protective of aquatic life, these levels have receded. No exceedances have been detected in soil samples, and sediment samples have likewise shown a regression in detections as shown in the pages below.

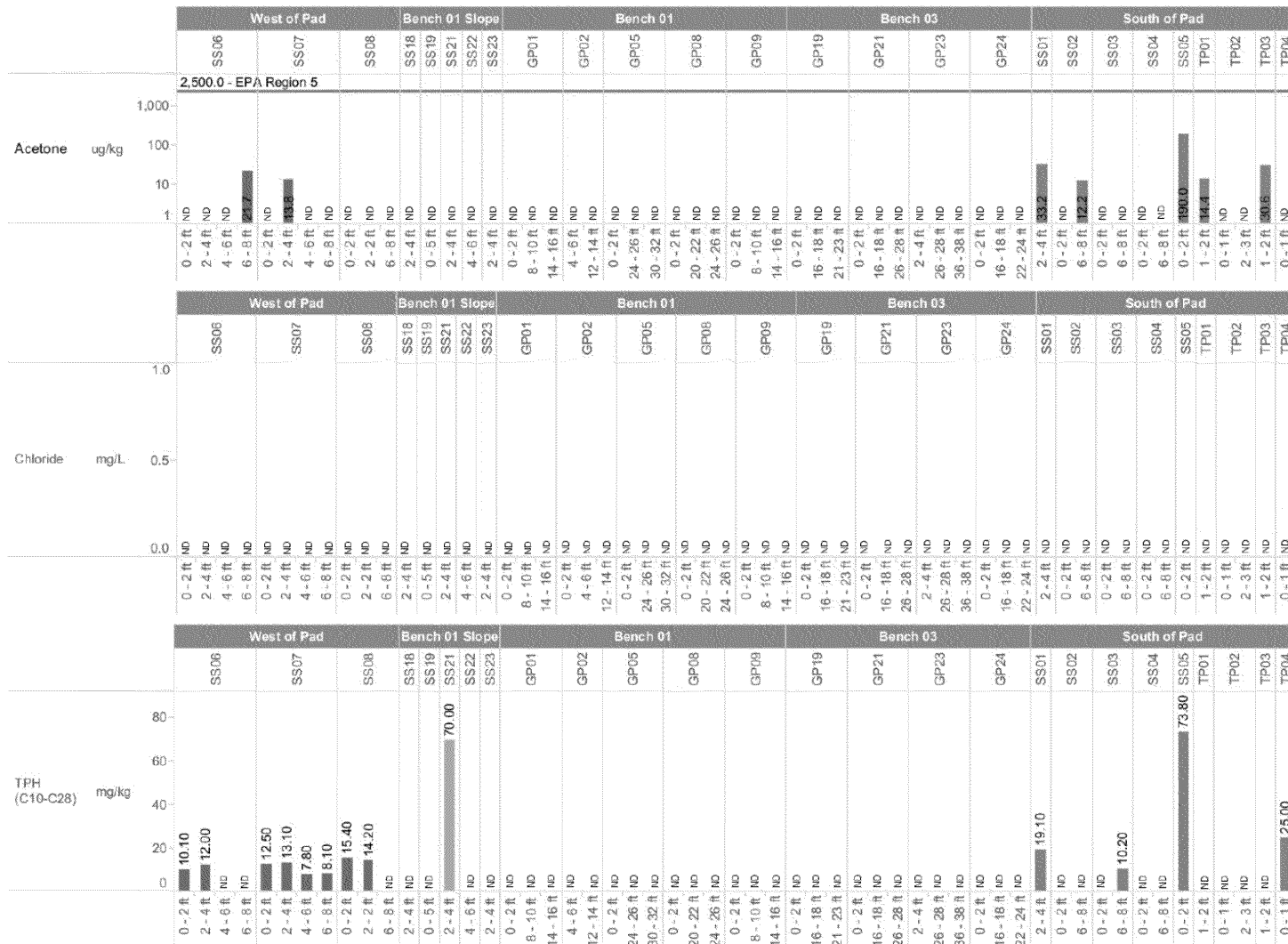


Note: ND = not detected in sample(s) analyzed; analyte concentration below method detection limit (MDL) established by Pace Laboratories

Detected Sediment Sample Concentrations: All



Maximum Detected Soil Sample Concentrations



3.0 Proposed Adjustment of Air & Environmental Sampling Location and Frequency

Based on the data provided, and current operational activities, the Environmental Unit, supporting Unified Command, proposed to adjust water, soil, and sediment collection activities.

Soil sampling activities will be completed on 7/18/2014 pending removal of equipment from the Eisenbarth well pad. Soil sampling will be discontinued until pad analysis can be performed or site changes indicate a need for additional testing.

A follow-up sediment sampling will be performed along the upstream tributaries, tributary and Opossum Creek after a rain event of 0.5" or more. Sediment sampling along the Ohio River will be discontinued. Additional sediment sampling events may be needed pending these results.

Water sampling along the Ohio River will be discontinued. Opossum Creek and the unnamed tributary will be sampled every third day while the Eisenbarth well-pad containment remains in place and until all equipment have been removed from the pad. Upon completion of surface remediation of the well-pad and removal of the containment, sampling along the tributary and Opossum Creek will occur daily for 5 days to ensure no changes in water quality after containment removal. Changes on site or rain activities may initiate additional sampling.

Sampling of well-pad run-off, including outflow pipes and drainage ditches, will continue and will be sampled every third day while the Eisenbarth well-pad containment remains in place and until all equipment have been removed from the pad. Daily, outflows will be assessed for changes in odor, water flow, and water quality. If changes are seen, sampling will be initiated. Once all outflows show that the COPCs are below action levels set by the USEPA and the well pad remediation is complete, the containments may be removed. Sampling will continue daily for 5 days after containment removal to ensure no changes in water quality.

Sampling will be rotated on a daily basis:

- ☐ Day 1 - Run-off/Pad Sampling
- ☐ Day 2 - Tributary Sampling
- ☐ Day 3 - Opossum Creek Sampling
- ☐ Repeat

Maps of sampling locations are included in Appendix A.

In addition, based on the data discussed above all samples will only be tested for:

- ☐ TPH (DRO)
- ☐ VOCS (Acetone)
- ☐ SM4500 (Chloride)
- ☐ TTPC (Biocide)
- ☐ General Water Quality Readings

All other analyte testing will be discontinued. If changes on site warrant additional analytes, they will be added.

Based on the results to date, air monitoring in the community will be discontinued until operations on the pad commence. At that time, air monitoring will resume 48 hours before operations for particulate matter (PM10), VOCs, and crystalline silica. Air monitoring will continue until remediation operations on the pad are complete. Air monitoring on the pad will continue for PM10 and VOCs while remediation operations are ongoing. Crystalline silica will be added when operations move to disrupting the sand contained on the well-pad.

As recovery operations change, sampling frequency and locations will be modified accordingly pending review of analytical data and approval of UC. 2 day turn-around-time will be requested for all samples sent to the lab unless otherwise requested by the UC.

Attachment A:

Analytical Sampling Map



Planned Surface Water Sample Locations (Well Pad)
Ohio Operations Incident



Project: 106393
Client: Statoil
City: Hannibal, OH
County: Monroe



CTEH

Planned Water Sampling Locations (Tributary) Ohio Operations Incident

Project: 106393
Client: StatOil
City: Hannibal, OH
County: Monroe



